

C2

Note Title

Exercise 1B (long division with algebra)

16/01/2007

1a

$$\begin{array}{r}
 x^2 + 5x + 3 \\
 x+1 \overline{) x^3 + 6x^2 + 8x + 3} \\
 \underline{-(x^3 + x^2)} \\
 5x^2 + 8x \\
 \underline{-(5x^2 + 5x)} \\
 3x + 3 \\
 \underline{-(3x + 3)} \\
 0
 \end{array}$$

so $\frac{x^3 + 6x^2 + 8x + 3}{x+1} = x^2 + 5x + 3$ (exactly)

check it by doing $(x+1)(x^2 + 5x + 3)$.

C2 Ex 1B

$$1b \quad \frac{x^3 + 10x^2 + 25x + 4}{x+4}$$

$$\begin{array}{r} x^2 + 6x + 1 \\ x+4 \overline{) x^3 + 10x^2 + 25x + 4} \\ \underline{-(x^3 + 4x^2)} \\ 6x^2 + 25x \\ \underline{-(6x^2 + 24x)} \\ x + 4 \end{array}$$

$$\text{so } \frac{x^3 + 10x^2 + 25x + 4}{x+4} = x^2 + 6x + 1$$

C2 Ex 18

$$1c \quad \frac{x^3 + 7x^2 - 3x - 54}{x + 6}$$

$$\begin{array}{r} x^2 + x - 9 \\ x+6 \overline{) x^3 + 7x^2 - 3x - 54} \\ \underline{-(x^3 + 6x^2)} \downarrow \\ \phantom{x+6 \overline{) }} x^2 - 3x \\ \underline{-(x^2 + 6x)} \\ \phantom{x+6 \overline{) }} -9x - 54 \\ \underline{-9x - 54} \\ \phantom{x+6 \overline{) }} 0 \end{array}$$

C2 Ex 1B

$$\begin{array}{r} 1d \quad x^3 + 9x^2 + 18x - 10 \\ \hline x + 5 \end{array}$$

$$\begin{array}{r} x^2 + 4x - 2 \\ x+5 \overline{) x^3 + 9x^2 + 18x - 10} \\ \underline{-(x^3 + 5x^2)} \end{array}$$

$$\begin{array}{r} 4x^2 + 18x \\ \underline{-(4x^2 + 20x)} \end{array}$$

$$-2x - 10$$

C2 Ex 1B

1e

$$\frac{x^3 - x^2 + x + 14}{x + 2}$$

$$\begin{array}{r} x^2 - 3x + 7 \\ x+2 \overline{) x^3 - x^2 + x + 14} \\ \underline{-(x^3 + 2x^2)} \\ -3x^2 + x \\ \underline{-(-3x^2 - 6x)} \\ 7x + 14 \\ \underline{-(7x + 14)} \\ 0 \end{array}$$

Gone wrong?

Check

- ① You wrote the right question (esp. -/+ signs)
- ② Your multiplication answers in each bracket. (esp. -x-)
- ③ That you've subtracted correctly.

c2 Ex 13

1f

$$\frac{x^3 + x^2 - 7x - 15}{x - 3}$$

$$\begin{array}{r} x^2 + 4x + 5 \\ x - 3 \overline{) x^3 + x^2 - 7x - 15} \\ \underline{-(x^3 - 3x^2)} \\ 4x^2 - 7x \\ \underline{-(4x - 12)} \\ 5x - 15 \\ \underline{-(5x - 15)} \\ 0 \end{array}$$

C2 Ex 13

$$1g \quad \frac{x^3 - 5x^2 + 8x - 4}{x - 2}$$

$$\begin{array}{r} x^2 - 3x + 2 \\ x-2 \overline{) x^3 - 5x^2 + 8x - 4} \\ \underline{-(x^3 - 2x^2)} \\ -3x^2 + 8x \\ \underline{-(-3x^2 + 6x)} \\ 2x - 4 \end{array}$$

1h

$$\frac{x^3 - 3x^2 + 8x - 6}{x-1}$$

$$\begin{array}{r} x^2 - 2x + 6 \\ x-1 \overline{) x^3 - 3x^2 + 8x - 6} \\ \underline{-(x^3 - x^2)} \\ -2x^2 + 8x \\ \underline{-(-2x + 2)} \\ 6x - 6 \end{array}$$

1i

$$\frac{x^3 - 8x^2 + 13x + 10}{x - 5}$$

$$\begin{array}{r} x^2 - 3x - 2 \\ x-5 \overline{) x^3 - 8x^2 + 13x + 10} \\ \underline{-(x^3 - 5x^2)} \\ -3x^2 + 13x \\ \underline{-(-3x^2 + 15x)} \\ -2x + 10 \\ \underline{-(-2x + 10)} \\ 0 \end{array}$$

1j

$$\frac{x^3 - 5x^2 - 6x - 56}{x - 7}$$

$$\begin{array}{r} x^2 + 2x + 8 \\ x - 7 \overline{) x^3 - 5x^2 - 6x - 56} \\ \underline{-(x^3 - 7x^2)} \\ 2x^2 - 6x \\ \underline{-(2x^2 - 14x)} \\ 8x - 56 \\ \underline{-(8x - 56)} \\ 0 \end{array}$$

2a

$$\frac{6x^3 + 27x^2 + 14x + 8}{x + 4}$$

$$\begin{array}{r} 6x^2 + 3x + 2 \\ x+4 \overline{) 6x^3 + 27x^2 + 14x + 8} \\ \underline{-(6x^3 + 24x^2)} \\ 3x^2 + 14x \\ \underline{-(3x^2 + 12x)} \\ 2x + 8 \end{array}$$

$$26 \quad \frac{4x^3 + 9x^2 - 3x - 10}{x+2}$$

$$\begin{array}{r} 4x^2 + x - 5 \\ x+2 \overline{) 4x^3 + 9x^2 - 3x - 10} \\ \underline{-(4x^3 + 8x^2)} \\ x^2 - 3x \\ \underline{-(x^2 + 2x)} \\ -5x - 10 \end{array}$$

$$2c \quad \frac{3x^3 - 10x^2 - 10x + 8}{x - 4}$$

$$\begin{array}{r}
 3x^2 + 2x - 2 \\
 x-4 \overline{) 3x^3 - 10x^2 - 10x + 8} \\
 \underline{-(3x^3 - 12x^2)} \\
 2x^2 - 10x \\
 \underline{-(2x^2 - 8x)} \\
 -2x + 8 \\
 \underline{-(-2x + 8)} \\
 0
 \end{array}$$

2d

$$\frac{3x^3 - 5x^2 - 4x - 24}{x - 3}$$

$$\begin{array}{r} 3x^2 + 4x + 8 \\ x-3 \overline{) 3x^3 - 5x^2 - 4x - 24} \\ \underline{-(3x^3 - 9x^2)} \\ 4x^2 - 4x \\ \underline{-(4x^2 - 12x)} \\ 8x - 24 \\ \underline{-(8x - 24)} \\ 0 \end{array}$$

2e

$$\frac{2x^3 + 4x^2 - 9x - 9}{x+3}$$

$$\begin{array}{r} 2x^2 - 2x - 3 \\ x+3 \overline{) 2x^3 + 4x^2 - 9x - 9} \\ \underline{-(2x^3 + 6x^2)} \downarrow \\ -2x^2 - 9x \downarrow \\ \underline{-(-2x^2 - 6x)} \downarrow \\ -3x - 9 \\ \underline{-(-3x - 9)} \\ 0 \end{array}$$

2f

$$\frac{2x^3 - 15x^2 + 14x + 24}{x - 6}$$

$$\begin{array}{r} 2x^2 - 3x - 4 \\ x-6 \overline{) 2x^3 - 15x^2 + 14x + 24} \\ \underline{-(2x^3 - 12x^2)} \\ -3x^2 + 14x \\ \underline{-(-3x^2 + 18x)} \\ -4x + 24 \\ \underline{-(-4x + 24)} \\ 0 \end{array}$$

$$2g \quad \frac{-3x^3 + 2x^2 - 2x - 7}{x+1}$$

$$\begin{array}{r} -3x^2 + 5x - 7 \\ x+1 \overline{) -3x^3 + 2x^2 - 2x - 7} \\ - [-3x^3 - 3x^2] \end{array}$$

$$\begin{array}{r} 5x^2 - 2x \\ - [5x^2 + 5x] \end{array}$$

$$\begin{array}{r} -7x - 7 \\ -7x - 7 \\ \hline 0 \end{array}$$

2h

$$\frac{-2x^3 + 5x^2 + 17x - 20}{x-4}$$

$$\begin{array}{r} -2x^2 - 3x + 5 \\ x-4 \overline{) -2x^3 + 5x^2 + 17x - 20} \\ \underline{-[-2x^3 + 8x^2]} \\ -3x^2 + 17x \\ \underline{-[-3x + 12x]} \\ 5x - 20 \\ \underline{-[5x - 20]} \\ 0 \end{array}$$

$$\text{Zi: } \frac{-5x^3 - 27x^2 + 23x + 20}{x + 6}$$

$$-5x^2 + 3x + 5$$

$$\begin{array}{r} x+6 \overline{) -5x^3 - 27x^2 + 23x + 20} \\ \underline{-[-5x^3 - 30x^2]} \quad \downarrow \\ \quad 3x^2 + 23x \quad \downarrow \\ \quad \underline{-[3x^2 + 18x]} \quad \downarrow \\ \qquad 5x + 20 \\ \qquad \underline{-[5x + 30]} \\ \qquad \qquad 0 \end{array}$$

2j

$$\frac{-4x^3 + 9x^2 - 3x + 2}{x-2}$$

$$\begin{array}{r} -4x^2 + x - 1 \\ x-2 \overline{) -4x^3 + 9x^2 - 3x + 2} \\ \underline{-(-4x^3 + 8x^2)} \\ x^2 - 3x \\ \underline{-(x^2 - 2x)} \\ -x + 2 \\ \underline{-(-x + 2)} \\ 0 \end{array}$$

3a

$$\frac{x^4 + 5x^3 + 2x^2 - 7x + 2}{x+2}$$

$$\begin{array}{r} x^3 + 7x^2 + 8x \\ x+2 \overline{) x^4 + 5x^3 + 2x^2 - 7x + 2} \\ \underline{-(x^4 - 2x^3)} \\ 7x^3 + 2x^2 \\ \underline{-(7x^3 + 14x^2)} \\ 8x^2 - 7x \\ \underline{-(8x^2 + 16x)} \\ 0 \end{array}$$

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$$\frac{x^4 + 11x^3 + 25x^2 - 29x - 20}{x+5}$$

$$\begin{array}{r} x^3 + 6x^2 - 5x - 4 \\ x+5 \overline{) x^4 + 11x^3 + 25x^2 - 29x - 20} \\ \underline{-(x^4 + 5x^3)} \\ 6x^3 + 25x^2 \\ \underline{-(6x^3 + 30x^2)} \\ -5x^2 - 29x \\ \underline{-(-5x^2 - 25x)} \\ -4x - 20 \\ \underline{-4x - 20} \\ 0 \end{array}$$

$$3c \quad \frac{4x^4 + 14x^3 + 3x^2 - 14x - 15}{x+3}$$

$$\begin{array}{r}
 4x^3 + 2x^2 - 3x - 5 \\
 x+3 \overline{) 4x^4 + 14x^3 + 3x^2 - 14x - 15} \\
 \underline{-(4x^4 + 12x^3)} \qquad \downarrow \\
 2x^3 + 3x^2 \qquad \downarrow \\
 \underline{-(2x^3 + 6x^2)} \qquad \downarrow \\
 -3x^2 - 14x \qquad \downarrow \\
 \underline{-(-3x^2 - 9x)} \qquad \downarrow \\
 -5x - 15 \\
 \underline{-5x - 15} \\
 0
 \end{array}$$

3d

$$\underline{3x^4 - 7x^3 - 23x^2 + 14x - 8}$$

$$x - 4$$

$$3x^3 + 5x^2 - 3x + 2$$

$$x - 4 \overline{) 3x^4 - 7x^3 - 23x^2 + 14x - 8}$$
$$\underline{- [3x^4 - 12x^3]} \quad \downarrow$$

$$5x^3 - 23x^2$$
$$\underline{- [5x^3 - 20x^2]} \quad \downarrow$$

$$-3x^2 + 14x$$
$$\underline{- [-3x^2 + 12x]} \quad \downarrow$$

$$2x - 8$$
$$\underline{- [2x - 8]}$$
$$0$$

3e

$$\frac{-3x^4 + 9x^3 - 10x^2 + x + 14}{x-2}$$

$$-3x^3 + 3x^2 - 4x - 7$$

$$x-2 \overline{) -3x^4 + 9x^3 - 10x^2 + x + 14}$$

$$-[-3x^4 + 6x^3]$$

$$3x^3 - 10x^2$$

$$-[3x^3 - 6x^2]$$

$$-4x^2 + x$$

$$-[-4x^2 + 8x]$$

$$-7x + 14$$

$$-7x + 14$$

$$0$$

3f

$$\frac{3x^5 + 17x^4 + 2x^3 - 38x^2 + 5x - 25}{x+5}$$

$$\begin{array}{r}
 3x^4 + 2x^3 - 8x^2 + 2x - 5 \\
 x+5 \overline{) 3x^5 + 17x^4 + 2x^3 - 38x^2 + 5x - 25} \\
 \underline{-(3x^5 + 15x^4)} \quad \downarrow \\
 2x^4 + 2x^3 \quad \quad \quad | \\
 \underline{-(2x^4 + 10x^3)} \quad \quad \quad | \\
 -8x^3 - 38x^2 \quad \quad \quad | \\
 \underline{-(-8x^3 - 40x^2)} \quad \quad \quad | \\
 2x^2 + 5x \\
 \underline{-(2x^2 + 10x)} \\
 -5x - 25 \\
 \underline{-5x - 25} \\
 0
 \end{array}$$

3g

$$\frac{6x^5 - 19x^4 + x^3 + x^2 + 13x + 6}{x - 3}$$

$$6x^4 - x^3 - 2x^2 - 5x - 2$$

$$x-3 \overline{) 6x^5 - 19x^4 + x^3 + x^2 + 13x + 6}$$

$$- [6x^5 - 18x^4]$$

$$-x^4 + x^3$$

$$- [-x^4 + 3x^3]$$

$$-2x^3 + x^2$$

$$- [-2x^3 + 6x^2]$$

$$-5x^2 + 13x$$

$$- [-5x^2 + 15x]$$

$$-2x + 6$$

$$- [-2x + 6]$$

0

$$3h \quad \underline{-5x^5 + 7x^4 + 2x^3 - 7x^2 + 10x - 7}$$

$$x-1$$

$$\begin{array}{r}
 -5x^4 + 2x^3 + 4x^2 - 3x + 7 \\
 x-1 \overline{) -5x^5 + 7x^4 + 2x^3 - 7x^2 + 10x - 7} \\
 \underline{-[-5x^5 + 5x^4]} \quad \downarrow \\
 2x^4 + 2x^3 \quad \downarrow \\
 \underline{-[2x^3 - 2x^3]} \quad \downarrow \\
 4x^3 - 7x^2 \quad \downarrow \\
 \underline{-[4x^3 - 4x^2]} \quad \downarrow \\
 -3x^2 + 10x \quad \downarrow \\
 \underline{-[-3x^2 + 3x]} \quad \downarrow \\
 7x - 7 \quad \downarrow \\
 \underline{-[7x - 7]} \\
 0
 \end{array}$$

$$3i \quad \frac{2x^6 - 11x^5 + 14x^4 - 16x^3 + 36x^2 - 10x - 24}{x-4}$$

$$\begin{array}{r}
 2x^5 - 3x^4 + 2x^3 - 8x^2 + 4x + 6 \\
 x-4 \overline{) 2x^6 - 11x^5 + 14x^4 - 16x^3 + 36x^2 - 10x - 24} \\
 \underline{-(2x^6 - 8x^5)} \\
 -3x^5 + 14x^4 \\
 \underline{-(-3x^5 + 12x^4)} \\
 2x^4 - 16x^3 \\
 \underline{-(2x^4 - 8x^3)} \\
 -8x^3 + 36x^2 \\
 \underline{-(-8x^3 + 32x^2)} \\
 4x^2 - 10x \\
 \underline{-(4x^2 - 16x)} \\
 6x - 24 \\
 \underline{-(6x - 24)} \\
 0
 \end{array}$$

3j

$$\frac{-x^6 + 4x^5 - 4x^4 + 4x^3 - 5x^2 + 7x - 3}{x-3}$$

$$\begin{array}{r}
 -x^5 + x^4 - x^3 + x^2 - 2x + 1 \\
 x-3 \overline{) -x^6 + 4x^5 - 4x^4 + 4x^3 - 5x^2 + 7x - 3} \\
 \underline{-[-x^6 + 3x^5]} \quad \downarrow \\
 \quad x^5 - 4x^4 \\
 \quad \underline{-[x^5 - 3x^4]} \\
 \quad \quad -x^4 + 4x^3 \\
 \quad \quad \underline{-[-x^4 + 3x^3]} \\
 \quad \quad \quad x^3 - 5x^2 \\
 \quad \quad \quad \underline{-[x^3 - 3x^2]} \\
 \quad \quad \quad \quad -2x^2 + 7x \\
 \quad \quad \quad \quad \underline{-[-2x^2 + 6x]} \\
 \quad \quad \quad \quad \quad x - 3 \\
 \quad \quad \quad \quad \quad \underline{-(x - 3)} \\
 \quad \quad \quad \quad \quad \quad 0
 \end{array}$$